Write your name here

Surname | Other names

Pearson Edexcel International GCSE

Centre Number | Candidate Number

Mathematics A

Practice paper 1H



Higher Tier

Time: 2 hours

Paper Reference **4MA1/PP1H**

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – *there may be more space than you need*.
- **Calculators may be used.**
- You must **NOT** write anything on the formula page.
  Anything you write on the formulae page will gain no credit.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question*.

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

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Arithmetic series

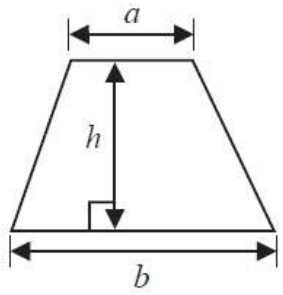
Sum to n terms, $S_n = \frac{n}{2}[2a + (n-1)d]$

The quadratic equation

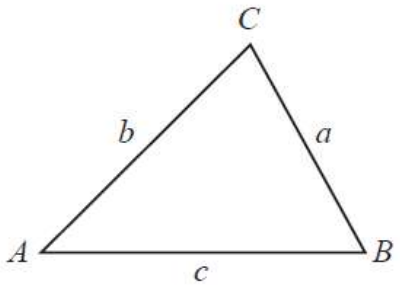
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Area of trapezium $= \frac{1}{2}(a+b)h$



Trigonometry



In any triangle ABC

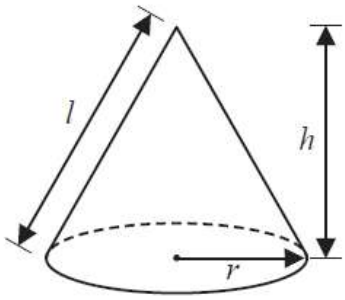
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc\cos A$

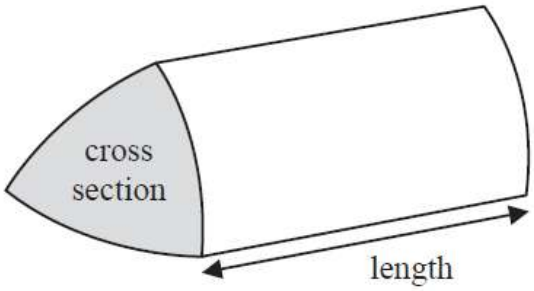
Area of triangle $= \frac{1}{2}ab\sin C$

Volume of cone $= \frac{1}{3}\pi r^2 h$

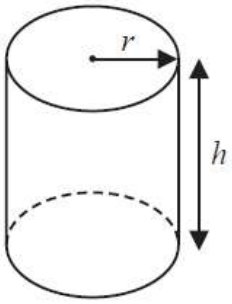
Curved surface area of cone $= \pi r l$



Volume of prism
= area of cross section × length

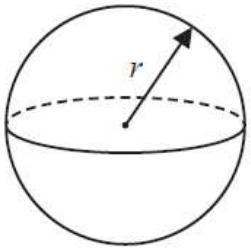


Volume of cylinder $= \pi r^2 h$
Curved surface area of cylinder $= 2\pi r h$



Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Answer ALL TWENTY THREE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Expand and simplify $(x - 3)(x + 7)$

$x^2 + 7x - 3x - 21$ (1)

$x^2 + 4x - 21$ (1)

(Total for Question 1 is 2 marks)

2

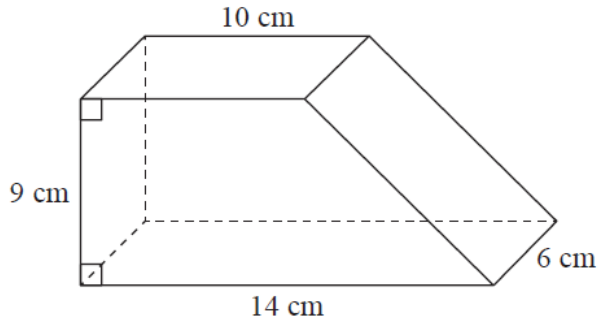


Diagram **NOT** accurately drawn

The diagram shows a solid prism.
The cross section of the prism is a trapezium.

The prism is made from wood with density 0.7 g/cm^3

Work out the mass of the prism.

Area cross section $= \frac{1}{2}(10+14) \times 9 = 108 \text{ cm}^2$ (1)

Volume $= 108 \times 6 = 648 \text{ cm}^3$ (1)

Density $= \frac{\text{Mass}}{\text{Volume}}$

Mass = Density x Volume $= 453.6$ (1)

$= 0.7 \times 648$ (1)

.....g

(Total for Question 2 is 4 marks)

---

3 The table shows information about the lengths, in cm, of 40 leaves.

Length (L cm)	Frequency
$0 < L \leqslant 1$ 0.5	x 4
$1 < L \leqslant 2$ 1.5	x 5
$2 < L \leqslant 3$ 2.5	x 11
$3 < L \leqslant 4$ 3.5	x 14
$4 < L \leqslant 5$ 4.5	x 6

2
7.5
27.5 (1)
49
27

(*a*) Write down the modal class.

$3 < L \leqslant 4$ (1)

.....

(1)

(*b*) Work out an estimate for the mean length of the 40 leaves.
Give your answer correct to 1 decimal place.

$$\text{mean} = \frac{2 + 7.5 + 27.5 + 49 + 27}{40}$$ (1)

$$= \frac{113}{40}$$ (1)

$$= 2.825$$

2.8 (1) cm

(4)

(Total for Question 3 is 5 marks)

4 Each time Astrid plays a game of chess against her computer, she will win or draw or lose.

For each game of chess
the probability that she will win is 0.3.
the probability that she will lose is three times the probability that she will draw.

On Tuesday, Astrid plays a game of chess against her computer.

Work out the probability that she will lose.

W D L
0.3 x 3x

$0.3 + x + 3x = 1$ (1)

$4x = 0.7$

$x = 0.175$ (1)

$P(\text{Lose}) = 3 \times 0.175$

$= 0.525$ (1)

.....

(Total for Question 4 is 3 marks)

5

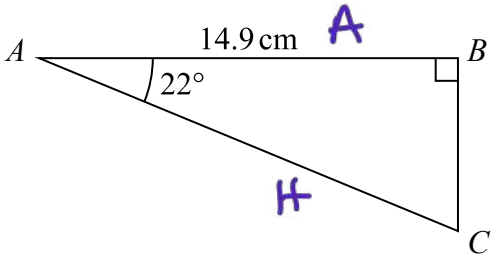


Diagram **NOT** accurately drawn

Calculate the length of AC.
Give your answer correct to 3 significant figures.

$\cos\theta = \frac{A}{H}$

$\cos 22 = \frac{14.9}{AC}$ (1)

$AC = \frac{14.9}{\cos 22}$ (1)

$= 16.0701\ldots$

16.1 (1) cm

(Total for Question 5 is 3 marks)

---

6 In 2014, Donald's weekly pay was \$640.
In 2015, Donald's weekly pay was \$668.80.

(*a*) Work out the percentage increase in Donald's pay between 2014 and 2015.

$$\% \text{ increase} = \frac{668.8 - 640}{640} \times 100 \quad (1)$$

$$= \frac{28.8}{640} \times 100 \quad (1)$$

$$= 4.5 \quad (1)$$

..... %

(3)

In 2015, Donald's weekly pay was 95% of his weekly pay in 2016.

(*b*) Work out Donald's weekly pay in 2016.

$$668.8 = 0.95x \quad (1)$$

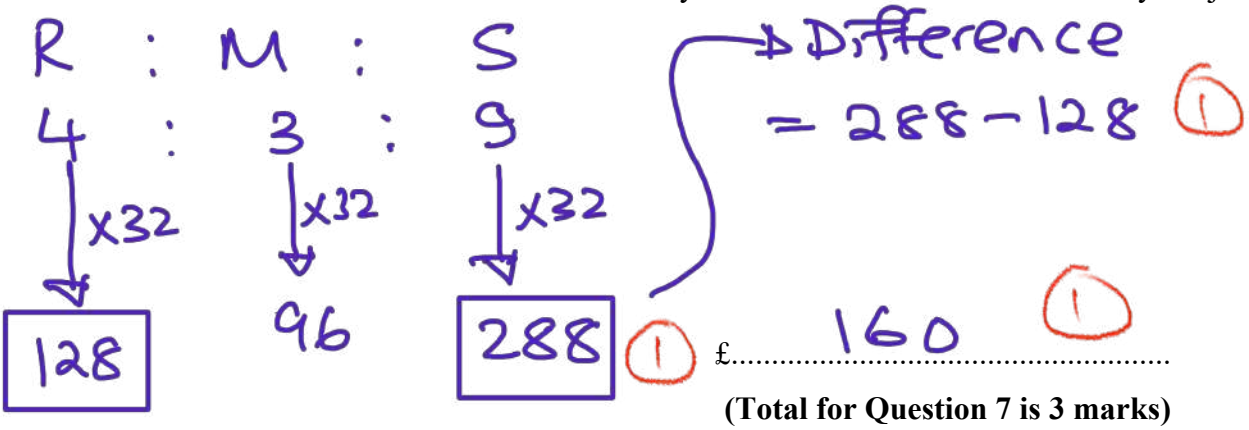
$$x = \frac{668.8}{0.95} \quad (1)$$

\$ 704 (1)

(3)

(Total for Question 6 is 6 marks)

7 Rachel, Mario and Sanjit share some money in the ratios 4 : 3 : 9
Mario receives £96.
Work out the difference between the amount received by Rachel and the amount received by Sanjit.

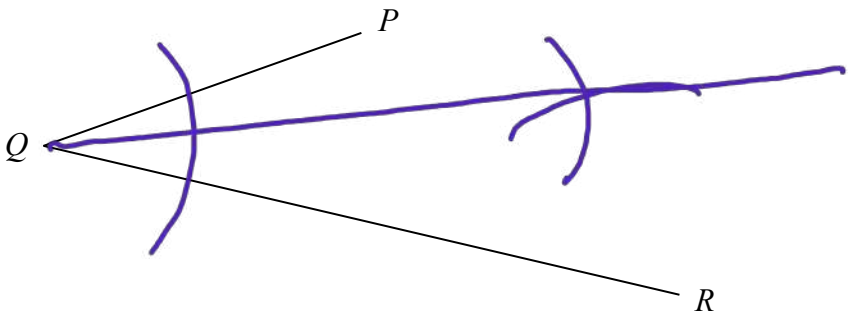


£ .....

(Total for Question 7 is 3 marks)

---

8 Use ruler and compasses to construct the bisector of angle *PQR*.
You must show all your construction lines.



(Total for Question 8 is 2 marks)

---

9 Solve the simultaneous equations

$$2x + 7y = 31 \quad \times 3$$
$$5x - 3y = 16 \quad \times 7$$

Show clear algebraic working.

$6x + 21y = 93$

$+ [35x - 21y = 112$ (1)

$41x = 205$

$x = 5$ (1)

Sub into $2x + 7y = 31$

$2(5) + 7y = 31$ (1)

$10 + 7y = 31$

$7y = 21$

$y = 3$

$x =$ 5 (1)

$y =$ 3

(Total for Question 9 is 4 marks)

---

10 Mabintou invested \$7500 for 3 years at 4% per year compound interest.

Calculate the value of her investment at the end of 3 years.

Value $= 7500 \times 1.04^3$ (1)

$= 8436.48$ (1)

\$ 8436.48 (1)

(Total for Question 10 is 3 marks)

---

11 The table gives information about the ages of all the 90 adults in a supermarket.

Age (t years)	Frequency
$20 < t \leqslant 30$	4
$30 < t \leqslant 40$	28
$40 < t \leqslant 50$	30
$50 < t \leqslant 60$	16
$60 < t \leqslant 70$	8
$70 < t \leqslant 80$	4

One of these 90 adults is picked at random.

(a) Find the probability that this adult's age is more than 50 years.

$P(>50) = \frac{16+8+4}{90} = \frac{28}{90}$ (1) (1)

.....

(2)

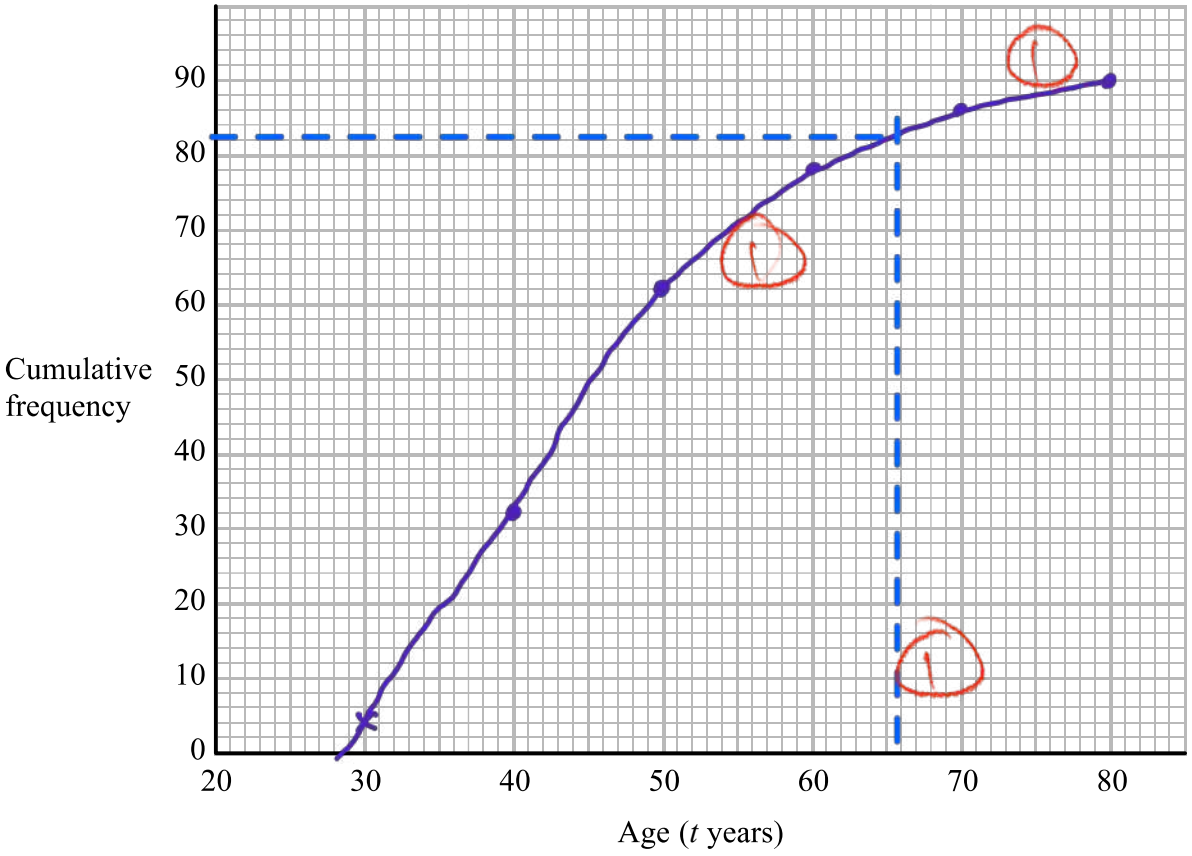
(b) Complete the cumulative frequency table for these 90 adults.

Age (t years)	Cumulative frequency
$20 < t \leqslant 30$	4
$20 < t \leqslant 40$	32
$20 < t \leqslant 50$	62
$20 < t \leqslant 60$	78
$20 < t \leqslant 70$	86
$20 < t \leqslant 80$	90

(1)

(1)

(*c*) On the grid, draw a cumulative frequency graph for your table.



(2)

All of these adults with an age greater than 65 years receive a discount on their shopping bill.

(*d*) Use your graph to find an estimate for the number of these adults who receive a discount.

98 − 82

81

.....

(2)

(Total for Question 11 is 7 marks)

---

12 (*a*) Write 0.000 451 in standard form.

4.51×10^{-4}

(1)

(*b*) Work out $\dfrac{7.8\times10^{5}}{2.4\times10^{-4}}$

Give your answer in standard form.

$= \dfrac{7.8}{2.4} \times \dfrac{10^{5}}{10^{-4}}$

$= 3.25 \times 10^{9}$ (1) (1)

3.25×10^{9}

(2)

(Total for Question 12 is 3 marks)

---

13 Expand and simplify $(x + 5)(x - 3)(x + 3)$

$(x+5)(x^2-9)$ (1)

$= x^3 - 9x + 5x^2 - 45$ (1)

$= x^3 + 5x^2 - 9x - 45$ (1)

(Total for Question 13 is 3 marks)

---

14 Here are two mathematically similar cups, **A** and **B**.

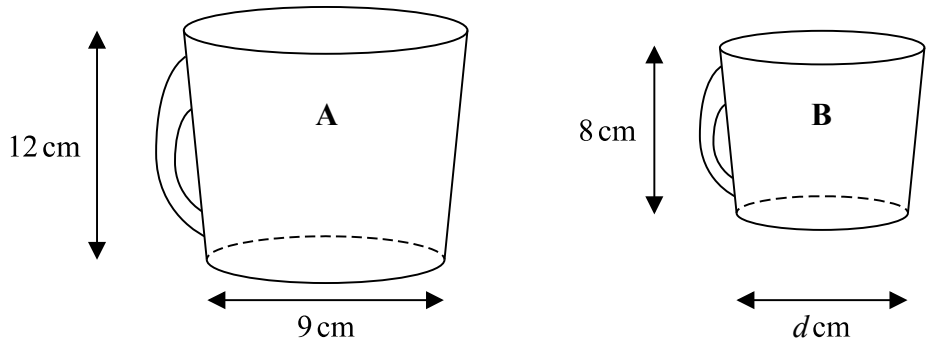


Diagram **NOT** accurately drawn

A has height 12 cm and base diameter 9 cm.
B has height 8 cm and base diameter d cm.

(a) Work out the value of d.

$\frac{d}{9} = \frac{8}{12}$ (1)

$d = \frac{8 \times 9}{12}$

$d = 6$ cm (1)

.....

(2)

The volume of **B** is 160 millilitres.

(b) Work out the volume of **A**.

Scale factor $= \frac{12}{8} = \frac{3}{2}$

VSF factor $= \frac{27}{8}$ (1)

VSF A $= \frac{27}{8} \times 160$

(1)

$= 540$

..... millilitres

(2)

Two solid plates, **P** and **Q**, are mathematically similar and made of the same material.

The surface area of **P** is p cm^2
The surface area of **Q** is q cm^2
The weight of **P** is w grams.

(c) Find an expression for the weight of **Q**.
Give your answer in terms of p, q and w.

Area factor $= \frac{q}{p}$

Scale factor $= \sqrt{\frac{q}{p}}$

Volume factor $= \left(\frac{q^{\frac{1}{2}}}{p^{\frac{1}{2}}}\right)^3$ (1)

P $\rightarrow$ Q $= \frac{q^{3/2}}{p^{3/2}} \times w$

Q $= \left(\sqrt{\frac{q}{p}}\right)^3 \times w$ (1)

..... grams

(2)

(Total for Question 14 is 6 marks)

15 (*a*) Simplify $\left(\sqrt{x}\right)^8$ $= \left(x^{\frac{1}{2}}\right)^8$

x^4 (1)

.....

(1)

(*b*) Solve $\frac{6+4y}{3} = 5-2y$

Show clear algebraic working.

$6+4y = 3(5-2y)$ (1)

$6+4y = 15-6y$ (1)

$10y = 9$ (1)

$y = \frac{9}{10}$

$y =$ $\frac{9}{10}$ (1)

(4)

(*c*) Make g the subject of $g - 1 = gh + 3h$

$g - gh = 3h + 1$ (1)

$g(1-h) = 3h+1$ (1)

$g = \frac{3h+1}{1-h}$ (1)

$g =$ $\frac{3h+1}{1-h}$

(3)

(Total for Question 15 is 8 marks)

16 M is inversely proportional to g^3
$M = 24$ when $g = 2.5$

(a) Find a formula for M in terms of g

$M = \frac{k}{g^3}$ (1)

$24 = \frac{k}{2.5^3}$ (1)

$375 = k$

$M = \frac{375}{g^3}$ (1)

(3)

(b) Work out the value of g when $M = \frac{1}{9}$

$\frac{1}{9} = \frac{375}{g^3}$

$g^3 = 375 \times 9$ (1)

$g^3 = 3375$

$g = \sqrt[3]{3375}$

$g = 15$ (1)

(2)

(Total for Question 16 is 5 marks)

17 $\left(5\sqrt{2}-e\right)\left(3\sqrt{2}+e\right)=f\sqrt{2}-6$

Given that e and f are positive integers,

find the value of e and the value of f.

$30+5e\sqrt{2}-3e\sqrt{2}-e^2=f\sqrt{2}-6$

$30+2e\sqrt{2}-e^2=f\sqrt{2}-6$ (1)

$2e=f$

$30-e^2=-6$

$36=e^2$

$6=e$

$f=2\times 6$

$e =$ 6 (1)

$f =$ 12 (1)

(Total for Question 17 is 3 marks)

18

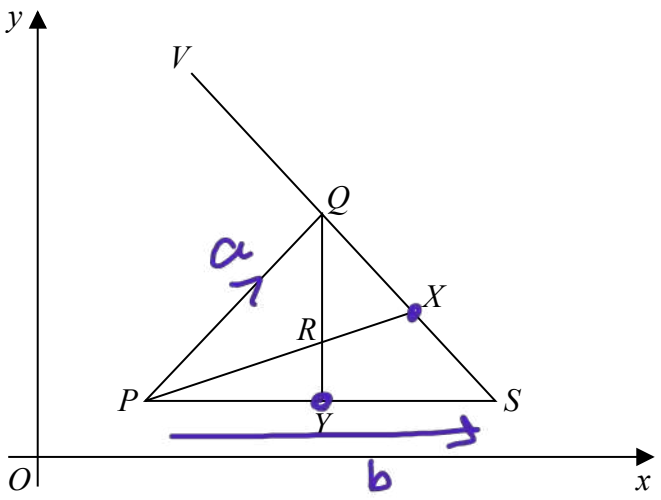


Diagram **NOT** accurately drawn

PQS is a triangle.
X is the midpoint of QS and Y is the midpoint of PS.

R is the point of intersection of PX and QY.
V is a point so that $VQXS$ is a straight line.

$\overrightarrow{PQ} = \mathbf{a}$ $\overrightarrow{PS} = \mathbf{b}$

(*a*) Find, in terms of **a** and **b**,

(i) $\overrightarrow{QS}$

$-a+b$ (1)

.....

(ii) $\overrightarrow{QY}$

$-a+\frac{1}{2}b$ (1)

.....

(iii) $\overrightarrow{PX}$ $= a+\frac{1}{2}(b-a)$

$= a+\frac{1}{2}b-\frac{1}{2}a$

$\frac{1}{2}a+\frac{1}{2}b$ (1)

.....

(3)

P has coordinates (3, 1) and $\overrightarrow{PR} = \frac{2}{3}\overrightarrow{PX}$

$\overrightarrow{PR} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$ and $\overrightarrow{XV} = \begin{pmatrix} -5 \\ 4 \end{pmatrix}$

(*b*) Work out the coordinates of V.

$PX = \frac{3}{2}PR$

$= \frac{3}{2}\begin{pmatrix} 4 \\ 2 \end{pmatrix}$

$= \begin{pmatrix} 6 \\ 3 \end{pmatrix}$

(..... , ...)

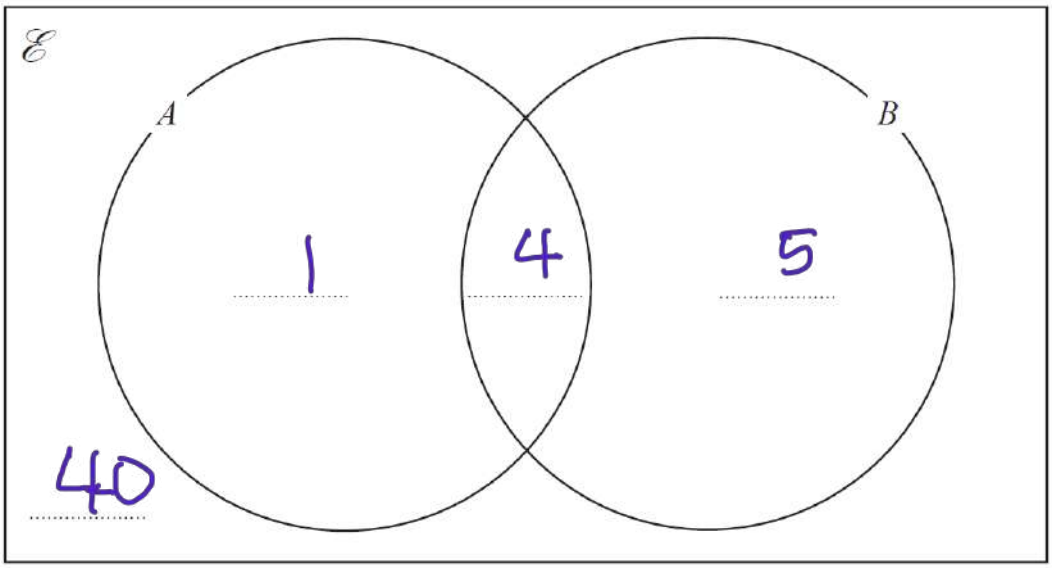
(3)

(Total for Question 18 is 6 marks)

19 A and B are two sets.

$$n(\mathscr{E}) = 50$$
$$n(A \cap B) = 4$$
$$n(A) = 5$$
$$n(B) = 9$$

(a) Complete the Venn diagram to show the numbers of elements.



(2)

(b) Find

(i) $n(A \cap B')$

1

(ii) $n(A \cup B')$

45

(2)

(Total for Question 19 is 4 marks)

---

20 $f(x) = \dfrac{4}{x-3}$

$g(x) = \dfrac{x-2}{x}$

(*a*) Express the inverse function f^{-1} in the form $f^{-1}(x) = ...$

let $y = \dfrac{4}{x-3}$

$y(x-3) = 4$ (1)

$xy - 3y = 4$

$xy = 3y + 4$ (1)

$x = \dfrac{3y+4}{y}$

$\dfrac{3x+4}{x}$ (1)

$f^{-1}(x) =$ .....

(3)

(*b*) Solve $fg(a) = 1$

Show clear algebraic working.

$f\left(\dfrac{a-2}{a}\right) = 1$

$\dfrac{4}{\left(\dfrac{a-2}{a}\right) - 3} = 1$ (1)

$4 = \dfrac{a-2}{a} - 3$

$4a = a - 2 - 3a$ (1)

$6a = -2$

$-\dfrac{1}{3}$ (1)

$a =$ .....

(3)

(Total for Question 20 is 6 marks)

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21 The diagram shows a triangular prism with a horizontal base $ABCD$.

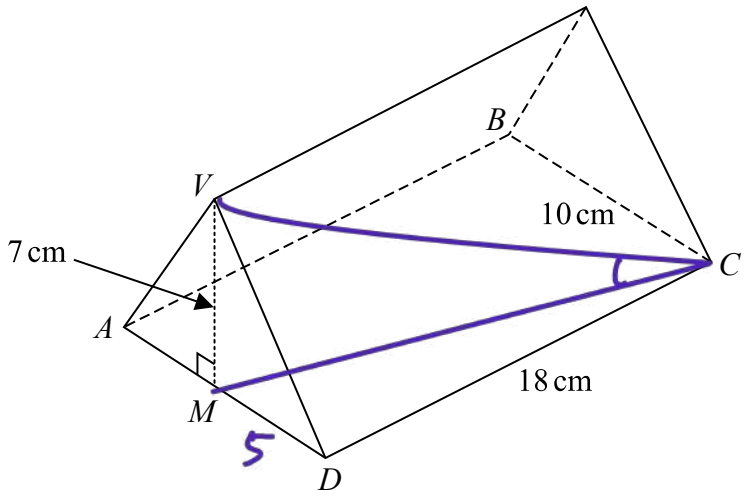


Diagram **NOT** accurately drawn

M is the midpoint of AD.
The vertex V is vertically above M.

$DC = 18$ cm, $BC = 10$ cm, $MV = 7$ cm.

Calculate the size of the angle between VC and the plane $ABCD$.
Give your answer correct to 3 significant figures.

$MC = \sqrt{18^2 + 5^2}$ (1) $= \sqrt{349} = 18.6815\ldots$ (1)

$\tan\theta = \frac{O}{A}$

$\tan\theta = \frac{7}{\sqrt{349}}$ (1)

$\theta = 20.5^\circ$ (1)

..... °

(Total for Question 21 is 4 marks)

22 Simplify fully $\dfrac{3}{2x+12} - \dfrac{x-15}{x^2-2x-48}$

Show clear algebraic working.

$$\frac{3}{2(x+6)} - \frac{x-15}{(x-8)(x+6)}$$

$$= \frac{3(x-8) - 2(x-15)}{2(x+6)(x-8)} \quad (1)$$

$$= \frac{3x - 24 - 2x + 30}{2(x+6)(x-8)} \quad (1)$$

$$= \frac{x+6}{2(x+6)(x-8)} \quad (1)$$

$$= \frac{1}{2(x-8)} \quad (1)$$

$$= \frac{1}{2x-16} \quad (1)$$

(Total for Question 22 is 5 marks)

23 The 3rd term of an arithmetic series, A, is 19.
The sum of the first 10 terms of A is 290.

Find the 10th term of A.

$U_n = a + (n-1)d$

$3^{rd} = a + 2d = 19$ (1)

$S_n = \frac{1}{2} n [2a + (n-1)d]$

$S_{10} = \frac{1}{2}(10)[2a + 9d] = 290$

$5[2a + 9d] = 290$

$2a + 9d = 58$ (1)

$2a + 9d = 58$

$(a + 2d = 19) \times 2$

$2a + 9d = 58$

$-[2a + 4d = 38]$ (1)

$5d = 20$

$d = 4$

$a + 8 = 19$

$a = 11$ (1)

$10^{th} = a + (n-1)d$

$= 11 + 9 \times 4$

47. (1)

.....

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS